

Broccoli Leaf Meal for Alfalfa Leaf Meal in Broiler Rations

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CHEMICAL analysis (2) and feeding trials (5) with broilers have shown that broccoli leaf meal is a valuable source of carotene, xanthophyll, riboflavin and the other water soluble vitamins for poultry rations. Broccoli leaf meal contains as much as 300,000 to 500,000 I.U. per lb of carotene and is on the average four to five times as potent as good alfalfa leaf meals. Although the riboflavin content of broccoli leaf meal equals that of dried skim milk, the carotene content is so great that a large surplus of carotene is fed if broccoli leaf meal is added to the diet on a riboflavin basis.

There has been some question in the past regarding the chicken's ability to utilize the pro-vitamin A, carotene, as well as the "true" vitamin A from fish liver oils. One group of workers (1) holds that the chicken utilizes as little as 24% of the carotene in its diet, while others (4) place the per cent absorbed at 60 providing there is sufficient fat in the diet. (It should be noted, however, that practical broiler rations will analyze at least 1% higher than the maximum amount of fat required for efficient adsorption.) Another group of workers (3) believe that the same number of units have the same effect on chickens whether fed as vitamin A or as carotene. Unpublished data collected by the authors from battery work with growing chicks confirm the opinion held by the latter group.

If this point of view is accepted, it is important to use broccoli leaf meal in such a way that its high carotene content is efficiently utilized.

The carotene content of feedstuffs has become a major consideration of feed mixers because of the wide usage of activated animal sterol as a source of vitamin D. This product contains no vitamin A and, unless sufficient carotene can be contained from the ingredients in the ration, a vitamin A feeding oil must be used to insure an adequate intake of this vitamin. When broccoli leaf meal of average or better potency is fed, additional A will not be needed except in unusual cases.

A number of feeding trials were made with broilers in batteries using broccoli leaf meal at various levels. At the lower levels, which allowed the usage of the carotene content most efficiently, it was necessary to supplement the broccoli with dried distillers' solubles (B-Y feed) or synthetic riboflavin to assure an optimum level of riboflavin. From these trials it was learned that broccoli leaf meal with added riboflavin could be used at a 1% level in place of 5% alfalfa leaf meal.

This article reports a feeding trial

in which this "spiked" broccoli leaf meal was used in a broiler ration and fed under commercial conditions.

Experimental

Four lots of 500 barred cross broiler chicks were started in 15- by 24-foot pens in a long broiler house with one coal stove and appropriate equipment for each pen.

The management of the broilers in each pen was kept as identical as possible. Only water was offered besides the mash except that, at 34 days of age, one half per cent sulfa-guanidine was added to the diet in each pen and fed for seven days. This treatment was given at the first sign of cecal coccidiosis, and seemed to be effective in controlling the outbreak because mortality was negligible.

The formula of the basal mash is shown in Table 1.

Four experimental diets were fed. Pen A was fed the basal mash supplemented with 5% alfalfa leaf meal. Pen B was fed the basal mash supplemented with 1% broccoli leaf meal while in Pen BR 1% broccoli leaf meal, "spiked" with crystalline riboflavin to a level of 120,000 units per lb, was used. The fourth lot, Pen X, was fed a first quality commercial broiler mash.

The chemical analysis of the diets used is shown in Table 2.

Chemical analysis did not, of course, evaluate the amount of vitamin A in the commercial mash from fish oil sources and it may therefore be assumed that the true level of vitamin A and carotene of this mash was even higher than the value shown in Table 2.

When such large number of chicks are started under commercial conditions, it is not practical to weigh them weekly. In this experiment body weight was taken at the end of the experiment when the broilers were 13 weeks of age. It was noted, by appearance, that the chicks in Pen X, fed the commercial broiler mash, started more rapidly than those in the other groups. This may be explained in part by the higher protein content of their diet. By the time the birds were six weeks of age, those in the BR pen had caught up and from then on were clearly the best looking pen in the experiment. This observation is borne out by the data in Table 3.

The pigmentation of the birds in all the groups was excellent and it was not possible to discern any differences among the several lots.

The average weight is also shown graphically to emphasize the difference between the group fed 1% broccoli leaf meal and the one fed broccoli leaf meal plus crystalline riboflavin. It is evident that broccoli

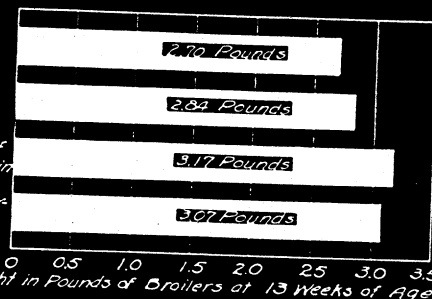
Diet

Basal + 5 %
Alfalfa Leaf Meal

Basal + 1 %
Broccoli Leaf Meal

Basal + 1 % Broccoli Leaf
Meal + Crystalline Riboflavin

A First Quality Commer-
cial Broiler Mash



must be supplemented with additional riboflavin if its high carotene content is to be used effectively.

Mortality was higher in the pen fed the commercial broiler mash. Three per cent of this mortality occurred between six and eight weeks of age and was diagnosed as a mild attack of intestinal coccidiosis. The other pens had very low mortality during this period even though all groups were confined in the same house. It had been observed that this diet caused the birds to have very "sticky" droppings and that the litter caked over in this pen before the others. Possibly this wet "sticky" litter provided a more favorable environment for the development of coccidia and the birds in this pen were therefore exposed to a heavier dose of the disease.

Summary

One per cent of broccoli leaf meal supplemented by crystalline riboflavin to a level of 120,000 micrograms per lb was superior to either 5% of alfalfa leaf meal or 1% broccoli leaf meal when added to the same basal mash.

The basal mash plus "spiked" broccoli leaf meal was also superior to a first quality commercial broiler mash as measured by rate of growth of the broilers and the pounds of feed required per lb of gain.

Broccoli leaf meal will be a valuable ingredient for use in broiler rations when it becomes commercially available.

References

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wastes as poultry feeds. Del. Agri. Expt. Sta. Bul. 247, 1944.

Table 1.—Basal Formula

Feed ingredients	Parts per 100
Ground yellow corn	30
Ground oats	15
Wheat bran	15
Cracked wheat	12
Soybean oil meal	15
Corn gluten meal	5
Fish meal	5
Steamed bone meal	1
Oyster shell flour	1.5
Salt mix*	.5
D [†] activated animal sterol	.075
	100.075

*A mixture of 100 lbs of iodized salt and 2 lbs anhydrous manganese sulfate.

Table 2.—Chemical Analysis of the Experimental Diets

Pen Treatment	Protein %	Fiber %	Water %	Riboflavin mg/gm lb	Carotene I.U. per lb
A 5% alfalfa leaf meal	21.1	5.75	4.42	1362*	4244
B 1% broccoli leaf meal	20.8	5.47	4.25	1407*	3793
BR 1% broccoli leaf meal plus crystalline riboflavin	20.5	5.28	4.45	1584*	4157
X Commercial broiler mash	24.0	4.57	6.43	1734	5611

*Calculated riboflavin content of this diet was 1,122 micrograms per lb.

*Calculated riboflavin content of this diet was 819 micrograms per lb.

*Calculated riboflavin content of this diet was 2,119.

Note: The calculated riboflavin content of the diets has been given because a wider difference was expected between the diets. Riboflavin is present in feedstuffs in small amounts and the method of determination is not accurate beyond 100-200 micrograms one way or the other. In this case the difference in riboflavin content between the diets may have been greater than shown by the chemical analysis.

Table 3.—Summary of the Growth, Efficiency in Use of Feed and Mortality Through 13 Weeks

Pen Treatment	Average Live of feed weight* per lb of gain	Mortality
A Basal plus 5% alfalfa leaf meal	2.70	5.5
B Basal plus 1% broccoli leaf meal	2.84	7.0
BR Basal plus 1% broccoli leaf meal plus crystalline riboflavin	3.17	5.2
X First quality commercial broiler mash	3.67	9.6

*Weighted average—assuming a 50-50 distribution between males and females.